



## Description

The VPX-300 is an architecture reference platform designed to support development of systems targeted for use in compute intensive applications which are implemented by using FPGAs for Front End / Back End processing. Examples include radar signal processing, image processing, and other applications requiring high bandwidth signal processing and data communications. As a proven FPGA reference platform, the VPX-300 insures that all VPX boards in the system have been selected and tested for interoperability.

## Dual Cluster Architecture for Front-End/Back-End Processing

- Designed around a Virtex-6 FPGA based front end processor (FEP) card
- Combining data and control plane topology, the architecture supports multi-processor capability via two clusters termed front end and back end
- The OpenVPX™ standard based backplane profile provides two separate star sections which are established through a data and control plane switch, handling both PCIe and Gigabit Ethernet links
- All slots in the backplane include control plane interconnects.
- The front end FPGA cluster performs incoming digital signal processing coupled via fabric using a Virtex-6 FPGA to a back end data cluster

## Graphics and CUDA Support

In addition to high bandwidth FPGA processing, the VPX-300 supports:

- An NVIDIA 240T graphics processing (GPU) unit for high definition image processing and graphics acceleration.
- Nvidia's CUDA parallel computing architecture, which enables dramatic increases in computing performance by harnessing the power of the GPU

## Elma's Target Application Profile (TAP) Concept

If a standard OpenVPX backplane profile cannot support the needs of the end application, then a new topology or system architecture, called target application profile (TAP) must be defined and manufactured. The topology in the VPX-300 is a TAP developed by Elma to address a range of high bandwidth, compute intensive applications. It is based on an existing standard OpenVPX backplane.

## Defining a TAP Profile

At Elma, we can design your TAP and deliver a complete system designed to precisely suit your application or your application development needs.

### We'll work with you to:

- Determine the backplane topology for the required data flow – Central Switched, Star, Distributed or Full Mesh.
- Determine if a standard OpenVPX backplane meets your needs

### If a standard backplane does not exist:

- Slot profiles are defined which meet the I/O requirements of the application.
  - Module profiles are identified that match the slot profiles and meet the functional needs of the application.
  - A TAP profile is developed based on elements of backplane profiles from the VITA 65 standard and the modules selected to meet your end application system requirements.
- The result is a backplane based on an OpenVPX standard, guaranteeing component interoperability.



## ACT/Technico™ brand of Embedded Computing Products

# VPX-300 Reference Platform

## VITA 65 Based VPX Backplane Design

The backplane used in the VPX-300 is a TAP profile based on a 7-slot backplane profile listed in the VITA 65 OpenVPX standard, BKP3-CEN07-15.2.3-n (Figure 1). A key element of this backplane profile is its support of Ethernet and PCIe switching capability in the data and control plane respectively. The backplane developed for the VPX-300 preserves the dual switching capability of the standard backplane while adding an expansion plane and a second compute cluster (Figure 2). This dual cluster architecture supports the front end and back end processing needs of the class of target applications.

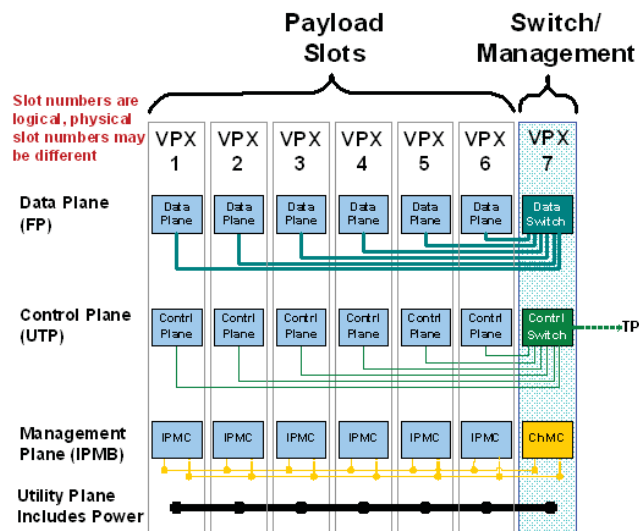


Figure 1: Topology of BKP3-CEN07-15.2.3-n  
Actual profile from VITA 65 specification

## VPX-300 TAP Architecture Description

The target application profile in the VPX-300 system is a topology that supports:

- Up to four FPGA carrier cards with intra-carrier data connections, Ethernet control planes and PCIe data planes interconnected via a configurable mesh
- Multiple general purpose processors
- Two processing segments; a 5 slot FPGA front end processing cluster and a 3 slot back end compute cluster.
- The backplane can also be used without the switch by using a configuration card that selectively connects PCIe links to either the FEP cards in the front end to the SBC in slot 5 and or connects the SBC in slot 1 to the modules in slots 6,7,8 and 9.

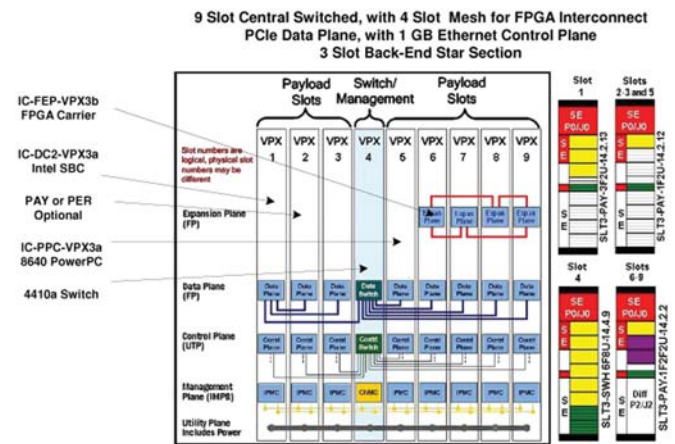
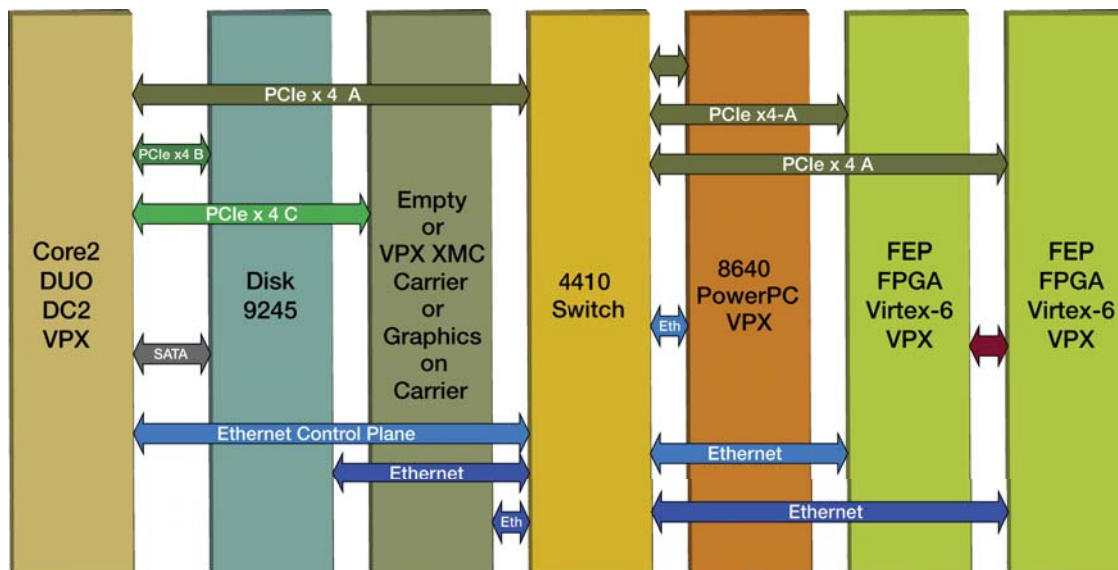


Figure 2: Topology of VPX-300 Architecture  
Elma's TAAP profile based upon specification profile in Fig. 1



VPX-300 9-slot OpenVPX backplane block diagram

# VPX-300 Reference Platform

Elma's VPX-300 includes leading edge VPX board products as defined below. As with all Elma pre-configured system platforms, alternative payload cards are available to suit a variety of application needs. Specific chassis level requirements including ruggedization are also available.

## Standard VPX-300 Model Number SEFV3PXCNICXNVN Configuration Includes:

- Intel Core 2 Duo SBC, model TIC-DC2-VPX3a
- Freescale MPC8640 1GHz processor, Model TIC-PPC-VPX3a
- Front end processor (FEP) with Xilinx Virtex 6 FPGA, model TIC-FEP-VPX3b
- NVIDIA GT 240 GPU based high definition graphics card, model GRA111
- Gigabit Ethernet and PCIe switch for control and data plane, model T4410
- 9-slot, 3U VPX E-Frame chassis with the target application backplane
- Ethernet and PCIe switching capability supported by the T4410a hybrid switch module from Elma switch module from Elma

## Front-End Cluster:

### Intel Conduction or Air Cooled 3U VPX Single Board Computer

#### Model TIC-DC2-VPX3a

- OpenVPX compliant
- SL9380 1.8 or 1.2GHz Core 2 Duo microprocessor
- I/O Interfaces:
  - 8 lanes available as one PCIe x 8 or two PCIe x 4 links
  - Dual Gig E ports, 2 each RS232 UARTs; USB2; and SATA ports, 8 GPIO, I2C bus



### Intel Conduction or Air Cooled 3U VPX Single Board Computer

#### Model VPX5311

- Meets VITA 46 (VPX) and 48 (REDI) standards
- Supports SATA, SAS, and PCIe interfaces
- Secure erasure for up to ten different erasure/sanitation methods
- Up to 1TB of storage capability in a single VPX slot



### NVIDIA GT 240 GPU Graphics Card

#### Model GRA111

The NVIDIA 240T card is located in the back end segment of the backplane and is tightly coupled to the SBC. It can be used for graphics processing and display or to further process data streams initially processed by the FEP cluster of the system.

- OpenVPX-compatible Graphics Processing Unit (GPU)
  - 96 Processor Cores
- Feature support: NVIDIA CUDA technology, OpenCL, OpenGL, NVIDIA PureVideo Technology (PUHD), NVIDIA PhysX-ready, Microsoft DirectX

### Gigabit Ethernet and PCIe Switch

#### Model T4410a - OpenVPX Compliant Switch

This hybrid switch provides both PCIe Gen II data plane fabric and GbE control plane fabric across all 9 slots.

- Control plane ports - Unmanaged
  - 8 x 10/100/1000Base-X [RB\_P2] (ultra thin pipes)
- Data plane ports - Unmanaged
  - 4 x PCIe x4 [RB\_P1] (fat pipes)
  - 2 x PCIe x4 [RB\_P2] (fat pipes)



## Back-End Cluster:

### Conduction or Air Cooled 3U VPX Single Board Computer (PPC)

#### Model TIC-PPC-VPX3a

- Freescale MPC8640 1GHz processor
- I/O interfaces:
  - One RS232/422/485 interface
  - Dual GbE Ethernet ports (as RJ45 front or 1000Kx via P1)
  - Dual 10/100/1000 Ethernet ports (as 1000BT or 1000Kx via P1)
  - Eight lanes via one PCIe x 8, two PCIe x 4, or four PCIe x 2 links
  - Four lanes via one PCIe x 4 or one SRIO x 4 link

### Xilinx Virtex 6, 3U VPX Board with FMC Site

#### Model TIC-FEP-VPX3b - OpenVPX Compliant Processing Unit

- Xilinx Virtex-6 XC6VSX315T (or XC6VLX195T)
- Four 4-lane Fabric ports (on P1)
- 1 x PCIe x4 or 2 x PCIe x2 (port A)
- 3 x GTX x4 (ports B, C & D)
- General purpose I/O (on P2)
- 16 x differential pairs (from FPGA)
- 16 x differential pairs (from FMC IOs connector)
- GPIOs user-defined on P1



### FMC Interfaces

The TIC-FEP-VPX3b offers a VITA 57 compatible FPGA Mezzanine Card site (FMC). FMCs provide high bandwidth FPGA signal conditioning functions for A/D and D/A converters, optical transceivers, serial I/O and Ethernet transceivers etc.

- 1 x GTX x4 link
- 68 Differential pairs
- 4 reference clocks
- 8 Single Ended I/O



### E-Frame Development Desktop Enclosure

- Model 39E09BWX98YVCHX
- 9-slot VITA 65 OpenVPX backplane
- High output 1200W power supply
- Integral high speed fan cooling
- System reset switch and LED indicators
- Test points for voltage

### Software

The VPX-300 supports VxWorks, Linux and Windows operating systems. Elma also supports device drivers where applicable.

# VPX-300 SystemPak

Elma Electronic offers a wide range of embedded computing products to help you build a system capable of meeting your requirements. Consider the following options and work with one of our Embedded Computing Architects to help you build the system you need using the Custom Configuration Key on the back page.

## Single Board Computers

- 3U and 6U VPX form factor SBCs feature the latest in Intel and Freescale processors

## Network Switches

- 1 GbE and 10 GbE bandwidth available in copper ports or fiber ports as well as PCI Express switches

## Storage

- Wide selection VPX and XMC boards using Compact Flash, 1.8", 2.5" form factor solid state or rotating hard drives

## VPX-300 FEP Reference Platform Order Information

To order this configuration, described in the box, please use the order number listed at right.

Description	Order Number
<ul style="list-style-type: none"><li>• TIC-DC2-VPX3a, Core2 Duo single board computer</li><li>• TIC-FEP-VPX3b, Virtex 6 front end processor</li><li>• GRA111, NVIDIA GT240, high performance graphics card</li><li>• T4310, Gigabit Ethernet and PCIe Switch</li><li>• T5311, 3U VPX Storage module</li></ul>	<p>SEFV3PXCNICXNVN      VPX-300 System, no graphics option SEFV3PXCNICXNVN-GRA      VPX-300 System, with graphics option</p>

## Custom Configuration Key

Different configurations are possible, although not all options are compatible. Please contact one of our Embedded Computing Architects to discuss specific requirements and learn about other embedded system solutions, or visit our website at [www.elmasystems.com](http://www.elmasystems.com).



ACT/Technico logo and brand of products are registered trademarks of Elma Electronic Inc.